EFFECT OF MOON PHASE AND LUNAR CYCLE ON THE LIGHT TRAP CATCH OF TOBACCO CATERPILLAR *SPODOPTERA LITURA* (FABR.) (LEPIDOPTERA: NOCTUIDAE)[1]

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(*With two text-figures*)

Effect of moon phase and lunar cycle on the light trap catch of Tobacco Caterpillar *Spodoptera litura* (Fabr.) was studied in detail during 1974-75 at Jabalpur. Light source was 250 Watt. Mercury Vapor lamp.

The fluctuations in the light trap catch observed over a period of 12 lunar cycles in a year showed a rthythmic pattern following a lunar rhythm. At same degree of moon phase the light trap catch was found to be higher in ascending phase (no moon to full moon).

Several workers in the past have reported relationship between the light trap collection and moon-phase or brightness of the moon (Dina Nath 1923; Williams 1936 and 1940; Nemec 1971; Agee *et al.* 1972 and Bowden & Church 1973). Most of the workers attempted to compare response of insects on full moon and no moon days only. They observed greatest response of insects during no moon period and lowest during full moon period. Bowden & Church (1973) examined the light trap catches of some insect species in relation to the regular changes in night illumination of the lunar cycle.

Apparent observations with the light trap catch of *Spodoptera litura* indicated existence of such a relationship. Attempts were made to study in detail the relationship between the response of moths towards light trap and day to day change in the moon phase and degree of illumination in a lunar cycle. The data of one year from June 1974 to May 1975, covering 12 lunar cycles were carefully analysed and results are discussed in this paper.

Materials and methods

One light trap unit was installed in an open field with light source *c* 3 metres above the ground level. Light trap unit was composed of 2 components—(A) trapping device made of 24 gauge G.I. sheet consisting of a funnel (60 cm top diameter) three baffles (45 × 23 cm in size) mounted vertically on a rim of the funnel placed equidistant and projecting towards the centre of the funnel and a rain shade over the baffles. (B) Insect collection cage 2 × 1 × 1 metre in size covered by a wire mesh screen. Light source was 250 Watt. Mercury Vapour lamp.

The position of moon phase for each calendar day of observation was determined from Indian Almanac published from Bombay. For practical purpose and data analysis the period

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of one lunar cycle of 29½ days was corrected to 30 days cycle. The two halves of the lunar cycle, i.e. ascending cycle (from no moon to full moon) and descending cycle (from full moon to no moon) were standardised to 15 days each. Little adjustments had to be made for these corrections.

The intensity of moon light was measured in terms of degree of moon phase. Full moon is considered as 360° phase and no moon as

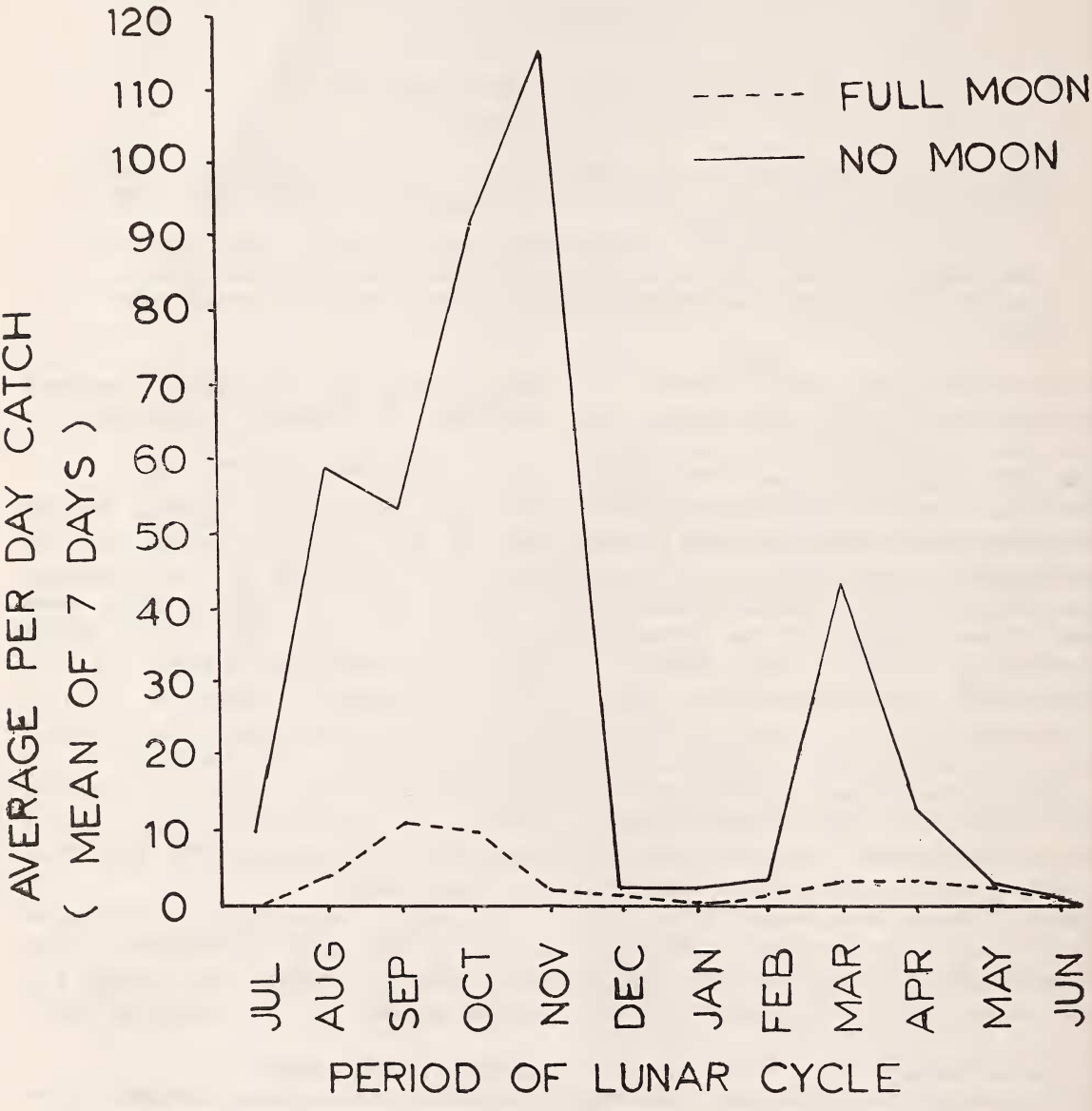

FIG.I

Fig. 1. Effect of moonphase on the light trap catch of *Spodoptera litura* at Jabalpur 1974-75.

0°. With the division of 360° by 15 (days), each day represent a change of 24°, plus or minus depending upon, ascending or descending lunar cycle respectively. Observations were recorded every day. Insects were collected every morning by hand picking and killing in cyanide killing jar. On rare occasions collection was made after 2 days. In such cases, collection was divided half for respective days.

Results and Discussion

At first, the response of moths around the two extremes of lunar phases, i.e. full moon *vs.* no moon, was studied. Average per day collection during ± 3 days around each phase was compared. Data of one complete year corresponding to 12 lunar cycles are presented in Table 1.

Table 1

Effect of moon phase (full moon *vs.* no moon) on the light trap catch of *Spodoptera litura* moths during 1974-75

Lunar Cycle No.	Period of Lunar cycle	Average per day catch of moths	
		Full Moon ± 3 days	No Moon ± 3 days
1.	July 74	0	10
2.	August	3.8	61
3.	September	10.8	53
4.	October	9.8	76.5
5.	Oct-Nov.	1.8	114.8
6.	Nov-Dec.	0.7	2.3
7.	Dec-Jan. 75	0.28	2.0
8.	Jan-Feb	0.57	3.1
9.	Feb-March	2.8	46.0
10.	March-April	2.8	11.7
11.	April-May	1.7	2.14
12.	May-June	0	0.14
Mean of 12 lunar cycles		2.92	31.89

Results clearly show that the light trap catch around 'full moon' was consistently very low as compared to 'no moon' period. Response during 'no moon' period was always very high (Fig. I). Nemec (1971) and Agee *et al.* (1972) also observed such a response with boll worms *Heliothis zea* (Boddie). Brightness of moon light has been observed to be major factor influencing the response.

To investigate whether the response is related to the intensity of moon's light, further analysis was made. The results of correlation and regression analysis clearly indicated the existence of significant negative correlation between the degree of moon phase or intensity of moon light and the light trap catch of moths (Table 2).

Table 2

Effect of lunar cycle and degree of moon phase on the light trap catch of *Spodoptera litura*

S. N.	Degree of noon phase (X)	Average per day catch (Mean of 12 lunar cycle of a year)	
		Ascending lunar cycle (Y_1)	Descending lunar cycle (Y_2)
1.	0	29.83	29.83
2.	24	35.40	25.45
3.	48	34.25	43.41
4.	72	24.92	34.83
5.	96	45.45	17.20
6.	120	17.40	28.50
7.	144	27.50	19.75
8.	168	31.60	15.75
9.	192	45.45	18.33
10.	216	45.00	18.30
11.	240	19.45	14.00
12.	264	27.63	8.58
13.	288	5.08	4.08
14.	312	3.91	1.83
15.	336	2.63	1.08
16.	360	1.66	1.66
Mean		24.82	17.66

't' value 2.483. Significant at 5% level.

Correlation Coeff. 'r' value −0.672 −0.883

Regression equation $Y_1 = 43.19 + (-0.098x)$

$Y_2 = 36.83 + (-0.1x)$

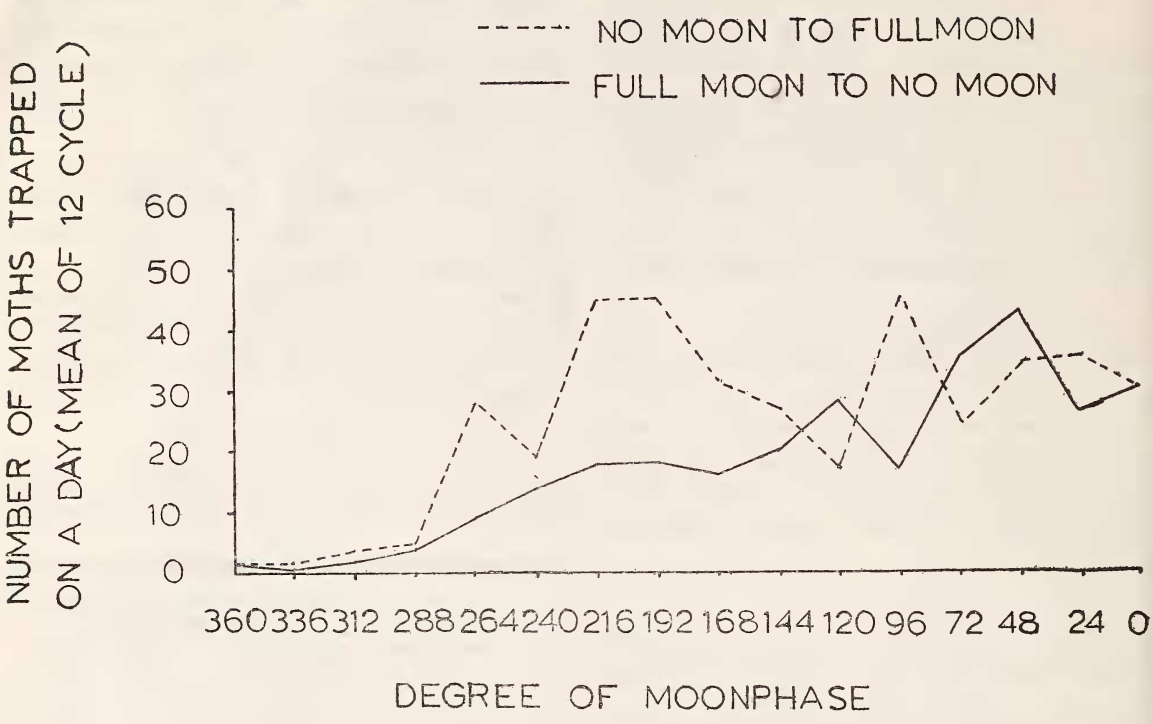

Fig. 2. Effect of lunar cycle and moonphase on the light trap catch of *Spodoptera litura* at Jabalpur 1974-75

Regression analysis showed a linear relationship between the two variables. Correlation was more strong in descending lunar cycle ('r' value – 0.8836) as compared to the ascending lunar cycle ('r' value – 0.672). Nemec (1971) also reported such a linear relationship with *Heliothis zea* but he explained it in general terms.

Further observations revealed a significant difference in the response of moths at the same degree of moon phase in ascending and descending cycle (Table 2). Statistical analysis of data (t value 2.483) and the response curves (Fig. II) reveal that with the same degree of moon's illumination the light trap catch of *S. litura* was always higher in ascending lunar cycle.

Although, the fluctuations in light trap catch in our present observations followed a lunar rhythm, lower during full moon period and higher during no moon period, it may not depend on the intensity of moon light only. Agee *et al.* (1972) pointed out that such a lunar rhythm, in case of *Heliothis zea,* may, depend on the synchronisation of activity and life-cycle of the pest species with the moon phase. He further stated whether moon light *per se* establishes the pattern or whether some physical phenomenon of host plants, temperature, etc. was responsible for this lunar rhythm is not known and should be determined.

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